

WHAT IS CLAIMED IS:

1           1. A method for treating a target region in tissue at or beneath a tissue  
2 surface, said method comprising:  
3                 deploying a first array of electrodes in the tissue at the target region;  
4                 deploying a second electrode on the tissue surface over the target region;  
5 and  
6                 applying electrical current to the tissue through the electrodes.

1           2. A method for treating a target region in tissue at or beneath a tissue  
2 surface, said method comprising:  
3                 deploying a first array of electrodes in the tissue at the target region;  
4                 deploying a cover over the tissue surface over the target region, wherein  
5 the first array and cover are drawn together to apply compression on tissue in the target  
6 region; and  
7                 applying electrical current to tissue in the target region through the first  
8 array of electrodes.

1           3. A method for treating a target region in tissue at or beneath a tissue  
2 surface, said method comprising:  
3                 deploying a first array of electrodes in the tissue at the target region;  
4                 deploying a cover over the tissue surface over the target region, wherein  
5 the cover is configured to electrically and thermally isolate the target region and first  
6 electrode array from external tissue structures adjacent to the target region; and  
7                 applying electrical current to tissue in the target region through the first  
8 array of electrodes.

1           4. A method as in any of claims 1, 2, or 3, wherein deploying the first  
2 array of electrodes comprises:  
3                 positioning a probe so that a portion of the probe is near the target region  
4 in the tissue; and  
5                 advancing a plurality of at least three array electrodes radially outwardly  
6 from the probe to define the first electrode array.

1           5. A method as in claim 4, wherein the probe is advanced directly into  
2 tissue with the array electrodes retracted within the probe.

1               6.     A method as in claim 4, wherein a combination of probe and stylet  
2 is initially advanced into the tissue, and wherein the stylet is withdrawn from the probe  
3 prior to advancing the array electrodes through the probe.

1               7.     A method as in claim 4, wherein advancing the array electrodes  
2 comprises advancing them forwardly from a distal end of the probe so that the electrodes  
3 evert outwardly as they are advanced into the tissue.

1               8.     A method as in claim 4, wherein the array electrodes deploy  
2 outwardly to a radius from 0.5 cm to 3 cm wherein fully distally extended.

1               9.     A method as in any of claims 1, 2, or 3, wherein the first array  
2 electrodes are deployed at a depth below the tissue surface in the range from 2 cm to  
3 10 cm.

1               10.    A method as in claim 1, wherein deploying the second electrode  
2 comprises engaging a plate electrode against the tissue surface.

1               11.    A method as in claim 10, wherein the plate electrode has an area in  
2 the range from 2 cm<sup>2</sup> to 10 cm<sup>2</sup>.

1               12.    A method as in claim 1, wherein deploying the second electrode  
2 comprises penetrating a plurality of tissue-penetrating electrode elements through the  
3 tissue surface.

1               13.    A method as in claim 12, wherein the plurality of tissue-penetrating  
2 electrode elements are penetrated over an area in the range from 2 cm<sup>2</sup> to 10 cm<sup>2</sup>.

1               14.    A method as in claim 13, wherein the electrode elements are  
2 penetrated to a depth in the range from 3 mm to 10 mm.

1               15.    A method as in claim 12, wherein the tissue-penetrating electrode  
2 elements are pins having a diameter in the range from 1 mm to 3 mm and a depth from  
3 the electrode face in the range from 3 mm to 10 mm.

1               16.    A method as in claim 4, further comprising removably attaching  
2 the second electrode to the probe after the array electrodes have been advanced.

1                   17. A method as in claim 1, wherein high frequency current is applied  
2 simultaneously through both the array electrodes and the second electrode attached to a  
3 common pole of a power supply in a monopolar mode.

1                   18. A method as in claim 1, wherein high frequency current is applied  
2 with one pole attached to the array electrodes and another pole attached to the second  
3 electrode in a bipolar fashion.

19. A method as in claim 1, wherein the high frequency current is applied successively from the electrodes in a monopolar mode.

1                   20. A method as in claim 2, wherein the high frequency current is  
2 applied first through the first array of electrodes to necrose tissue at or near a boundary of  
3 the target region to inhibit blood flow into the target region.

21. A method as in claim 2 or 3, wherein the cover comprises a rigid plate.

22. A method as in claim 2 or 3, wherein the cover comprises a  
conformable surface.

23. A method as in claim 2 or 3, wherein the cover is composed of an electrically non-conductive material.

24. A method as in claim 2 or 3, wherein the cover and first electrode array are drawn together with a force of at least 0.5 psi.

1                   25. A method as in claim 2 or 3, wherein deploying the first electrode  
2 array comprises positioning a probe so that a portion of the probe lies near the target  
3 region and deploying the cover comprises securing the cover to the probe after the probe  
4 has been deployed.

1                   26. A method for heat-mediated necrosis of a target region in tissue,  
2 said method comprising:  
3                   inhibiting blood flow into the target region, wherein inhibiting comprises  
4 creating a blood flow barrier across a tissue boundary or throughout the target region; and

heating the tissue within the target region for a time and of a power level sufficient to necrose said tissue, wherein blood flow inhibition reduces the amount of energy required to heat the tissue.

27. A method as in claim 26, wherein inhibiting blood flow comprises heating the tissue at or near a distal boundary of the target region to at least partially block the vasculature leading into and out of the target region.

28. A method as in claim 27, wherein the inhibiting step comprises deploying an electrode array proximal the distal boundary and delivering high frequency energy from the array into the tissue.

29. A method as in claim 28, wherein heating of the target region comprises engaging a second electrode against an area of tissue overlying the target region and delivering high frequency energy from the electrode to the target region.

30. A method as in claim 29, wherein the electrode array and the second electrode are deployed to compress tissue therebetween and further inhibit blood flow into the target region.

31. A method as in claim 26, wherein inhibiting blood flow comprises compressing tissue within the target region sufficiently to reduce blood flow therethrough.

32. A system for treating a target region in tissue beneath a tissue surface, said system comprising:  
a probe having a distal end adapted to be positioned beneath the tissue surface to a site in the tissue;  
a plurality of electrodes deployable from the distal end of the probe to span a region of tissue proximate the target region; and  
a cover removably attachable to the probe and adapted to span an area of the tissue surface over the target region.

33. A system as in claim 32, wherein the cover has a generally flat face.

1               34.     A system as in claim 32, wherein the cover has an area in the range  
2 from 2 cm<sup>2</sup> to 10 cm<sup>2</sup>.

1               35.     A system as in claim 32, wherein the cover comprises a surface  
2 electrode including a support having an electrode face and an electrically and/or thermally  
3 insulated face opposite to the electrode face.

1               36.     A system as in claim 35, wherein the surface electrode comprises a  
2 plurality of tissue-penetrating elements on the electrode face.

1               37.     A system as in claim 36, wherein the surface electrodes comprises  
2 from 4 to 16 tissue-penetrating elements.

1               38.     A system as in claim 36, wherein the tissue-penetrating elements  
2 are pins having a diameter in the range from 1 mm to 3 mm and a depth from the  
3 electrode face in the range from 3 mm to 10 mm.

1               39.     A system as in claim 32, further comprising a connector on the  
2 cover which removably attaches said electrode to the probe.

1               40.     A system as in claim 32, further comprising a connector on the  
2 cover which is selectively attachable at different axial positions along the probe.

1               41.     A system as in claim 36, wherein the surface electrode is adapted  
2 to mechanically couple to the probe, wherein the plurality of electrodes and surface  
3 electrodes are electrically coupled for monopolar operation.

1               42.     A system as in claim 41, wherein the surface electrode is  
2 electrically coupled to the probe electrodes when the surface electrode is mounted on the  
3 probe.

1               43.     A system as in claim 41, wherein the surface electrode is  
2 electrically isolated from the probe electrodes when the surface electrode is mounted on  
3 the probe.

1                  44. A system as in claim 36, wherein the surface electrode is adapted  
2 to mechanically couple to the probe, wherein the plurality of electrodes remain  
3 electrically isolated from the surface electrode for bipolar operation.

1                  45. A system as in claim 32, wherein the probe comprises:  
2                  a cannula having a proximal end, a distal end, and a lumen extending to at  
3 least the distal end, and wherein the plurality of electrodes are resilient and disposed in  
4 the cannula lumen to reciprocate between a proximally retracted position wherein all  
5 electrodes are radially constrained within the lumen and a distally extended position  
6 wherein all electrodes deploy radially outwardly, said plurality including at least three  
7 electrodes.

1                  46. A system as in claim 45, wherein at least some of the electrodes are  
2 shaped so that they assume an outwardly everted configuration as they are extended  
3 distally into tissue from the distal end of the cannula.

1                  47. A system as in claim 45, further comprising a rod structure  
2 reciprocatably received in cannula lumen, wherein the electrodes are secured at a distal  
3 end of the rod in an equally spaced-apart pattern.

1                  48. A system as in claim 45, wherein the cannula has a tissue-  
2 penetrating member at its distal end to permit advancement of the cannula through tissue.

1                  49. A system as in claim 45, further comprising a stylet reciprocatably  
2 received in the cannula lumen, wherein the stylet may be used for initially positioning the  
3 cannula in tissue and thereafter exchanged with the electrodes.

1                  50. A system as in claim 45, wherein the cannula has a length in the  
2 range from 5 cm to 30 cm and an outer diameter in the range from 1 mm to 5 mm.

1                  51. A system as in claim 45, wherein the electrodes deploy outwardly  
2 to a radius in the range from 0.5 cm to 3 cm when fully distally extended from the  
3 cannula.

1                  52. A system as in claim 45, wherein the plurality includes at least five  
2 electrodes.

- 1               53. A system as in claim 45, wherein the plurality includes at least  
2 eight electrodes.
- 1               54. A system as in claim 45, wherein the plurality includes at least ten  
2 electrodes.
- 1               55. A system as in claim 36, wherein the active areas of the first  
2 electrode array and the second electrode are approximately equal and the first electrode  
3 array and second electrode are electrically isolated.
- 1               56. A surface electrode comprising:  
2                 a support structure attachable to an elongate probe and having an area in  
3 the range from 2 cm<sup>2</sup> to 10 cm<sup>2</sup>;  
4                 4 to 16 tissue-penetrating pin electrodes projecting from the support  
5 structure and having a length in the range from 3 mm to 10 mm and a diameter in the  
6 range from 1 mm to 3 mm.
- 1               57. A kit comprising:  
2                 an electrode or cover adapted to be engaged against a tissue surface; and  
3                 instructions for treating a target region in tissue using the electrode in  
4 combination with an electrode array according to any of claims 1, 2, or 3.
- 1               58. A kit as in claim 57, further comprising the electrode array.
- 1               59. In a method for applying high frequency electrical energy to tissue  
2 a target region beneath a tissue surface, an improvement comprising compressing the  
3 target region sufficiently to inhibit blood flow therethrough while high frequency  
4 electrical energy is being applied.
- 1               60. A method as in claim 59, wherein the target region is compressed  
2 between a first array of electrodes beneath the tissue surface and a cover or second  
3 electrode on the tissue surface.
- 1               61. A method as in claim 59, wherein the target region is compressed  
2 between a pair of spaced-apart structures which are both penetrated into the tissue.

1               62.     A method for positioning an electrode array beneath a tissue  
2     surface, said method comprising:  
3               determining a target depth;  
4               positioning a cover on a tissue-penetrating probe so that an array  
5     deployment location on the probe is located away from the cover by a distance  
6     corresponding to the target depth;  
7               penetrating the probe into tissue until the cover engages the tissue surface;  
8     and  
9               deploying the electrode array from the deployment location.